**3GPP TSG- Meeting #**

**, , – May 24th**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** | NR\_Redcap-Core | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | Clarification of the interruption time requirements for Redcap | | | | | | | | |
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| ***Summary of change:*** | | Following clarifications have been made:   * Re-ordering the wording * Clarifying measured SSB and target SSB to avoid future confuson | | | | | | | | |
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| ***Consequences if not approved:*** | | Unclear specification with risk of future confusion. | | | | | | | | |
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| ***Clauses affected:*** | | 6.1D.1.2, 6.1D.1.3 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Same changes are made for HO interruption requirements for BWP\_wor in R4-2408159 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## <Start of Change #1>

#### 6.1D.1.2 NR FR1 - NR FR1 Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR1 cell to NR FR1 cell.

##### 6.1D.1.2.1 Handover delay

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover msec from the end of the last TTI containing the RRC command.

Where:

Dhandover equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1D.1.2.2.

##### 6.1D.1.2.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than Tinterrupt:

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Where:

Tsearch is the time required to search the target cell which depends on whether the target cell is already known when the handover command is received by the UE.

- If the target cell is a known intra-frequency cell, Tsearch = 0ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then Tsearch = 1\*Trs ms if UE is capable of 2 Rx antennas; Tsearch = 2\*Trs ms if UE is only required to support 1 Rx antenna.

- If the target cell is a known inter-frequency cell, then

if the measured SSB is the target SSB of the HO target cell, Tsearch = 0ms;

if the measured SSB of the target cell and the target SSB of the HO target cell belong to the same NR target cell and fulfil the following conditions, Tsearch = Trs ms:

* + - The measured SSB is the CD-SSB in the active DL BWP and the target SSB of the handover target cell is the NCD-SSB in the RedCap specific DL BWP, or
    - The measured SSB is the NCD-SSB in the active RedCap specific DL BWP SSB and the target SSB of the handover target cell is the CD-SSB in the first active DL BWP, or
    - The measured SSB is the NCD-SSB and the target SSB is the NCD-SSB of the HO of the target cell and both are within different RedCap specific DL BWPs

Otherwise, the target cell is an unknown inter-frequency cell. In this case, if the target cell Es/Iot≥-2 dB, then Tsearch = 3\* Trs ms if the UE is operating with 2 Rx antennas; Tsearch = 5\*Trs ms if UE is operating with only 1 Rx antenna.

Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

T∆ is time for fine time tracking and acquiring full timing information of the target cell. T∆ = Trs for both known and unknown target cell.

Tprocessing is time for UE processing. Tprocessing can be up to 20ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise,

- Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing as NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, as CD-SSB indicated by *absoluteFrequencySSB* in *frequencyInfoDL* in handover command.

- If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

For RedCap UE with HD-FDD, the handover requirements are met provided that

- SSB is available at the UE once every SMTC period during Tsearch

- One SSB is available during T∆

- One SSB is available during TIU.

In FR1, the target cell is known if it has been meeting the following conditions:

- At least one of the SSBs measured belongs to the same NR target cell,

- During the last 5 seconds before the reception of the handover command:

- at least one of the SSBs measured which belongs to the same NR target cell remains detectable according to the cell identification requirements as described in clause 9.2B for intra-frequency measurements and clause 9.3B for inter-frequency measurements,

- The reference SSB of the NR target cell also remains detectable during the handover delay according to the cell identification requirements are described in clause 9.2B for intra-frequency handover and clause 9.3B for inter-frequency handover.

Otherwise, it is unknown.

#### 6.1D.1.3 NR FR2- NR FR2 Handover

The requirements in this clause are applicable to both intra-frequency and inter-frequency handovers from NR FR2 cell to NR FR2 cell.

##### 6.1D.1.3.1 Handover delay

When the UE receives a RRC message implying handover the UE shall be ready to start the transmission of the new uplink PRACH channel within Dhandover msec from the end of the last TTI containing the RRC command.

Where:

Dhandover equals the applicable RRC procedure delay defined in clause 12 in TS 38.331 [2] plus the interruption time stated in clause 6.1D.1.3.2.

##### 6.1D.1.3.2 Interruption time

The interruption time is the time between end of the last TTI containing the RRC command on the old PDSCH and the time the UE starts transmission of the new PRACH, excluding the RRC procedure delay.

When intra-frequency or inter-frequency handover is commanded, the interruption time shall be less than Tinterrupt:

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Where:

Tsearch is the time required to search the target cell which depends on whether the target cell is already known when the handover command is received by the UE.

- If the target cell is a known intra-frequency cell, Tsearch = 0ms. If the target cell is an unknown intra-frequency cell and the target cell Es/Iot≥-2 dB, then Tsearch = N\*Trs ms, where N = 8.

- If the target cell is a known inter-frequency cell, then

if the measured SSB is the target SSB of the HO target cell, Tsearch = 0ms;

if the measured SSB of the target cell and the target SSB of the HO target cell belong to the same NR target cell and fulfil the following conditions, Tsearch = Trs ms:

* + - The measured SSB is the CD-SSB in the active DL BWP SSB and the target SSB of the handover target cell is the NCD-SSB in the RedCap specific DL BWP, or
    - The measured SSB is the NCD-SSB in the active RedCap specific DL BWP SSB and the target SSB of the handover target cell is the CD-SSB in the first active DL BWP, or
    - The measured SSB is a NCD-SSB and the target SSB is a NCD-SSB of the HO of the target cell and both are within different RedCap specific DL BWPs

Otherwise, the target cell is an unknown inter-frequency cell. In this case, if the target cell Es/Iot≥-2 dB, then Tsearch = 3\*N\* Trs ms.

Regardless of whether DRX is in use by the UE, Tsearch shall still be based on non-DRX target cell search times.

T∆ is time for fine time tracking and acquiring full timing information of the target cell. T∆ = Trs for both known and unknown target cell.

Tprocessing is time for UE processing. Tprocessing can be up to 20ms.

Tmargin is time for SSB post-processing. Tmargin can be up to 2ms.

TIU is the interruption uncertainty in acquiring the first available PRACH occasion in the new cell. TIU can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in the table 8.1-1 of TS 38.213 [3].

Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise,

- Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing as NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, as CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command.

- If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell.

In FR2, the target cell is known if it has been meeting the following conditions:

- At least one of the SSBs measured belongs to the same NR target cell,

- During the last 5 seconds before the reception of the handover command:

- the UE has sent a valid measurement report for the target cell and

- at least one of the SSBs measured which belongs to the same NR target cell remains detectable according to the cell identification requirements as described in clause 9.2B for intra-frequency measurements and clause 9.3B for inter-frequency measurements,

- The reference SSB of the NR target cell also remains detectable during the handover delay according to the cell identification requirements are described in clause 9.2B for intra-frequency handover and clause 9.3B for inter-frequency handover.

Otherwise, it is unknown.

## <End of Change #1>